Following this slide is a presentation that Tom Dalheim made in October 2003 at the EA-6B Program Management Review. The presentation contains the Next Generation Jammer program concept with some notional or speculative details. The slides giving dimensions and weights are for approximation only. The most important goal for the pod is to keep it within the envelope of the F-18E/F 480 Gallon Drop Fuel Tank.

Slides 4, 6, and 7 contain photos or illustrations of a visual demonstration concept pod made by Boeing several years ago. It was not for flight purposes, and Boeing did not continue the development. The shape and location of the air scoop is insignificant. In fact, a permanently open duct like the one shown would contribute much more air drag than a closable duct. Slide 8 contains an illustration of a different conceptual pod shape.

Airborne Electronic Attack
Next Generation Jammer

09 October, 2003

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Overview

- **Program Concept**
- **Mission Need**
- **Future Pod Alternatives**
- **Program Details**
- **Activities – Past/Present/Future**

Program Concept

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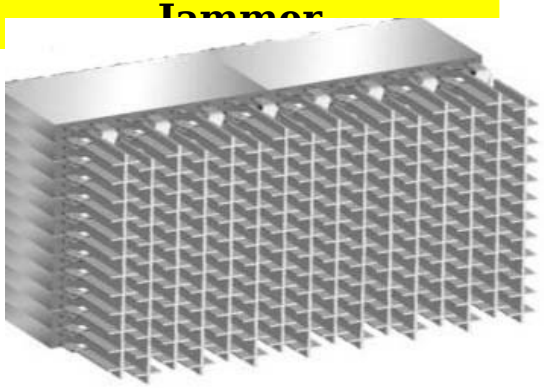
Next Generation Jammer



Active Electronically Scanned Array (AESA) Technology

Develop New EA assets for EA-18G

- Increased Performance to Counter Evolving Radar and Communication Threats
- Take Advantage of New Technology
  - Solid-State Active Electronically Scanned Arrays

Retire ALQ-99 Pods

- Eliminate ALQ-99 Recurring Asset Obsolescence & High Ownership Cost
- Avoid continuation of costly upgrades that yield marginal war-fighting improvements

USAF EA pod for B-52 & EA Payloads for J-UCAS & MALD

- Capitalize on potential for coordinated development & common AESA & exciter components

Why Do We Need NextGen Jammer?

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- To MAINTAIN the current contribution of EA from SOJ's, the pod set requires…..
  - Complete spectrum coverage
  - More ERP to compensate for
  - More jammer modulation options
  - Polarization control
  - More EA assets (effectively)
    - Jam more threats
    - Reduced effects of stores blockage
- To ENHANCE more "unconventional EA" capabilities
- To replace ALQ-99 Pods that won't live forever!
  - Capability won't keep pace w/threat
  - ALQ-99 upgrade path is expensive & long
  - It's not a matter of "if" to replace, just "when"

Alternatives

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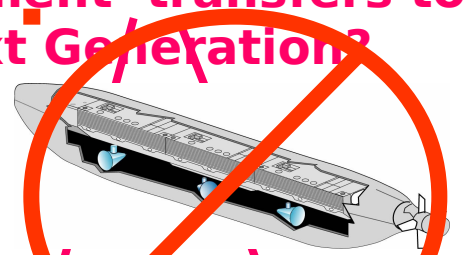
Evolving & Changing Threats

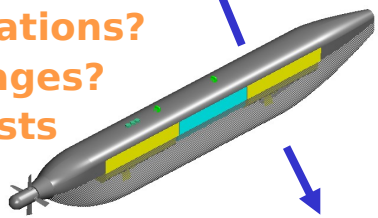
Should we pursue these?
- How long will they take?
- How much will they cost?
- How high is the risk?

How long will these last?
- Performance limitations?
- Inventory shortages?
- Ownership Costs

How much of this investment transfers to Next Generation?

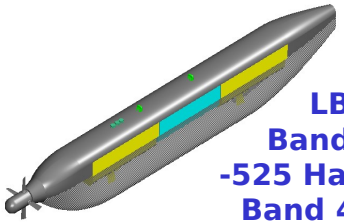


3-Transmitter Pod
LBT -525 Hardback
Band 4/6 Advanced Exciter
Band 7/8 Low Drag RAT
Band 9/10 Fiber Optic Interface



LBT
UEU
Band 4
Band 5/6
Band 7
Band 8
Band 7/8
Band 9/10
-525 Hardback

~~Band 4/6~~
Band 7/8 FOC?



LBT
Band 7/8
-525 Hardback
Band 4 TWT
Band 9/10
UEU

Band 1 Band 5/6
Band 2 Band 7
nt Bd 2/3 Band 8
Band 4 Band 9

Dec '02 Stakeholder Meeting Outcome

NextGen Jammer
AESA Architecture
- Low Band Pod
- High Band Pod
- Advanced Exciter
- Pod Structure
- Power/Cooling Source (RAT)
- Fiber Optic Interface

What is it?
How long will it take?
How much will it cost?
How high is the risk?

What ALQ-99 Sustainment Investments Required?

Current ALQ-99 P	EA-18G/EA-6B ALQ-99 P	Next Generation Jammer
2003	2009	2012 — 2020

EA-18G Trade Space

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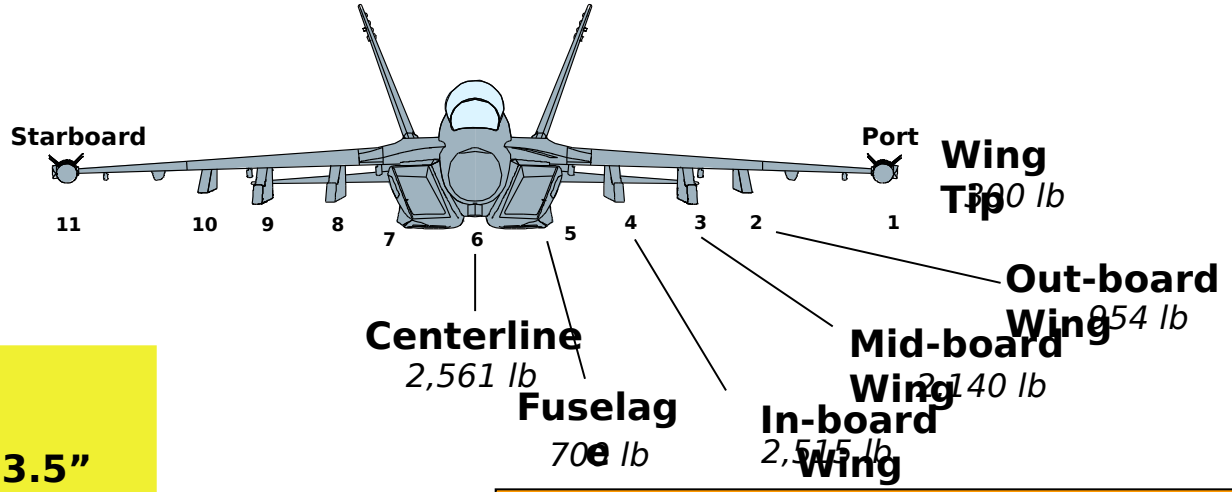
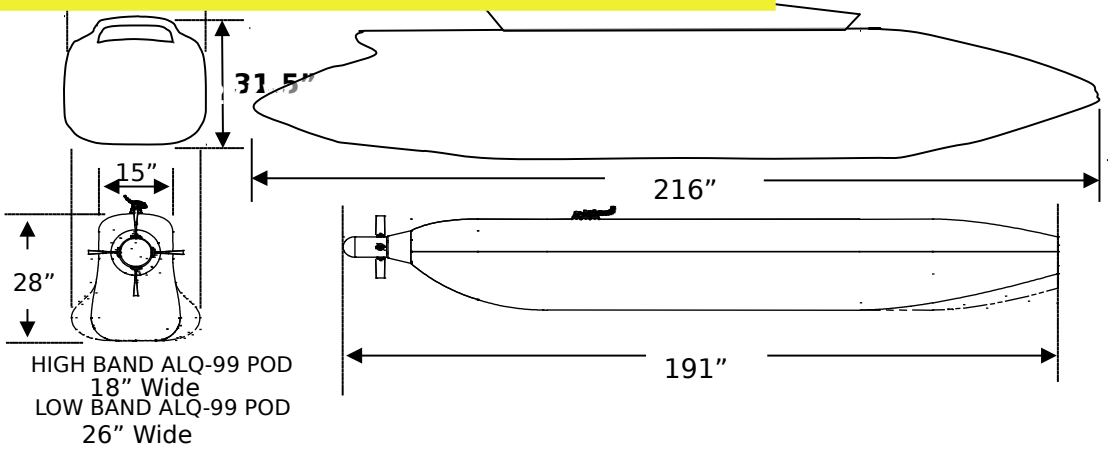
Stations 2 & 10
- **1000 lb Pod**
- **115” long x 13.9” in high and wide.**
  - **Could be taller (+12 in), but must meet clearance**

Stations 3,4,6,8 & 9
- **2000+ lb Pod**
- **216” Long x 31.5” high x 33.5” wide**





Total Pod Set Weight

≈ 5,000 lb

- **Design pods to satisfy comprehensive long term requirements**
  - **Number of pods is unspecified**
  - **Jammer “bands” are unspecified**
- **Incremental development of capabilities possible**
- **Pod internals not required to be mission configurable**
  - **But pod set must be able to accommodate varying threat scenarios**
- **Pod concept must take airframe blockage and likely stores into**

Pod Configurations (Most Likely)

- 1 Pod Set Per Aircraft
- Pod "Set" = 3 Pods
  - Pod Set Provides Complete Radar/Comms
  - 2 Pod Configurations
    - Centerline Pod w/360⁰ Coverage
    - 2 Mid-board Pods w/180⁰ Coverage
      - May be possible to operate on Outboard Stations*
  - Centerline Pod Covers 1 Portion of Total Bandwidth & Mid-Board Pod Covers the R
  - All 3 Pods Identical In Shape*, but Not Weight
    - Approximate Size of 480 Gallon Drop Tank
  - Major Pod WRAs: Pod Structure, Radomes, RAT Power/Cooling Unit, Transmitter/Antenna Arrays, Exciter, Beam & Pod Control/Interface Processor Elements

Performance "Goals"

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- Frequency coverage for radar and comm threats
- 360 degree Field of Regard (FOR) at every frequency
- Increase ERP over current ALQ-99 transmitters
- Better polarization capabilities
- Fratricide reduction
- Advanced jamming modulations

Frequency Priorities

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RADAR

#1 F_1 to F_2

#2 F_2 to F_3

#3 F_0 to F_2

#4 F_3 to F_4

COMMS

#1 F_1-100 to F_2

#2 F_2 to F_3+500

#3 F_0-20 to F_1–10

#4 F_3+500 to F_4+2000

Technology Needs

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- **Wide Band Gap (WBG) Semiconductors**
  - Silicon Carbide (SiC) / Gallium Nitride (GaN) / High Voltage GaAs
- **Broadband Microwave Power Modules (MPM)**
- **Advanced Apertures**
  - Dual-Pol Quad Notch Radiators
  - Di-Pole Arrays
  - Emerging Technologies
- **Power Generation**
  - High Efficiency/Low Drag Turbines
  - Variable Speed Constant Frequency (VSCF) Ge
  - DC Power Generation
- **Advanced Cooling Techniques**
  - Advanced Chillplate/Heat Exchange Technologi
  - Evaporative Spray Cooling
- **Advanced Exciter**
  - Direct Digital Synthesis (DDS)
  - High Speed Memory (HSM)/Digital RF Memory
  - Field Programmable Gate Array (FPGA) Based
- **Fiber Optics Backplane/Interface**
  - RF & Data over Fiber

Requires Advances in "State-of-the-Art"

Broadband

Discussions w/ONR to Investigate Possibilities of Future NextGen

Discussions w/USAF to Investigate Possibilities of Joint Risk Reduction Efforts

Program Schedule
(Notional)

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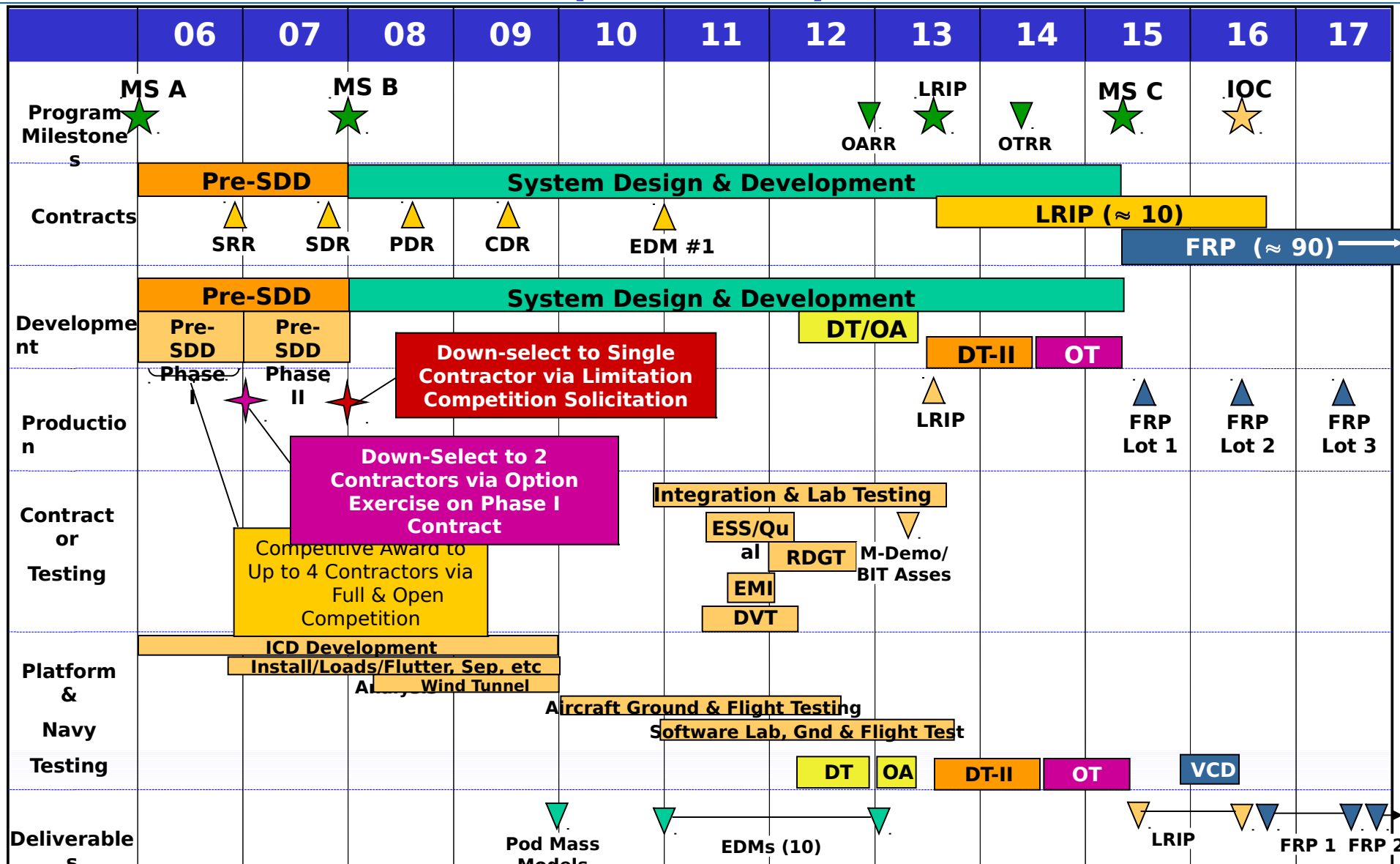

Inventory Objective

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- **EA-18G Inventory**

		EA-18 (5 Per)
		VAQ
CVW Squadrons		10
Expeditionary Sqds		
Total Squadrons		
PAA		5
Total Active PAA		50
Reserve Squadrons		0
PAA		0
Toal Reserve PAA		0
Total PMAA		50
Overhead Aircraft		
FRS		12
FDNF Plus Up		1
RDT&E		3
Pipe		11
Total Overhead		27
Attrition		13
Total		90

- **NextGen Jammer Inventory**

Inventory Represent Number of "Pod Ship Sets", which is projected to be 3 pods on each aircraft		Quantity
CVW Squadron Outiftting		60
Reserve Squadrons		0
Total Pods Sets for 10 CVW Sqdns		60
Overhead Aircraft Outiftting		
FRS Aircraft		6
FDNF Plus-Up Aircraft		0
RDT&E Aircraft		4
Pod Maintenance Pipeline		15
Pod Attrition		15
Total Pod Ship Sets		100

NextGen Jammer Cost Estimating

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- **Working to Build High Fidelity Estimate**
  - **Industry Estimate Inputs**
    - > **Pre-SDD/SDD/LRIP/FRP**
    - > **Provides Pod "Sets" Required to Outfit 50 Aircraft**
    - > **Aircraft Integration Element Not Included**
  - **Additional Cost Elements to Build**
    - > **EA-18G Aircraft Integration Costs**
      - ✓**Air Vehicle Performance, Hardware/Software Development & Integration**
    - > **Government Costs**
      - ✓**IPT, Acquisition, GFE, Software Development/Integration, Testing**
    - > **Cost Deltas for Incremental Development Options**
  - **Working with AIR-4.2 on POM06 Cost Estimate**

Who is Involved?

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- **Navy (EA-18G & EA-6B)**
  - **CVWP, OPNAV, APW-41, PMA-234, PMA-265, OPTEVFOR, ONR, NRL NAVAIR 4.0, NAWCAD Pax, NAWCWD Mugu, NSWC Crane**
- **APL/JHU (EA-18G & EA-6B)**
- **Air Force (AEA, LMSJ, B-52)**
  - **ACC, SAF AQ, ASC, AFRL, WRALC, B-52 SPO, JUCAS**
- **DARPA (UCAV)**
- **OSD (AEA)**
- **Industry (EA-18G, EA-6B, B52, JUCAS, LMSJ, SIRFC/IDEC etc..)**
  - **BAE Systems, ITT, Northrop Grumman, Raytheon, Boeing**

Industry/DoD Discussions

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- Dec '02 - Decision to Pursue Program
- Jan-Feb '03 – Initial Program & Performance Objectives Developed
- 20 Feb – 1st "Industry Day" Session
  - Present Prog & Performance Objectives
  - Solicit Industry Participation
- 01 Apr – 2nd Industry Day
  - Received Initial Concepts from Industry
- 21 Apr – Industry Inputs Provided
  - Pod Concepts/Architectures/Performance Projections
- 13 May – Industry Inputs Provided
  - Addition Technical Detail
  - Initial Cost & Schedule Estimates
- 03-04 Jun – Industry Day #3
  - Review & Discuss All Industry Inputs
- 23-24 Jun – Industry Day #4
  - Expanded Technical Discussions
- 30 Jun – Industry Inputs Provided
  - Final Concept/Updated Cost & Schedule Estimates/Spiral & Non-Spiral Alternatives
- 30 Jul – Briefing to OSD EW IPT
- 18 Aug – NextGen Jammer FNC Discussions w/ONR & OSD DDR&E
- 09-18 Sep – Industry Visits & Discussions
- 23-24 Sep – USN/USAF AEA Discussions

What's Next?

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- Oct-Dec '03
  - Initial Program Baseline Build & Cost/Schedule/ Performance Estimate
  - POM-06 Process
    - Starts w/Brief to PEO(T)
- 18 Nov '03
  - Technical Meeting @ Pax to Develop Initial Performance Requirements

If Things Go Well…

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- POM06 Input Accepted & Funded
- Pre-SDD Start FY06
  - Spec Development/SRR/SDR
  - Advanced Component Development Tied to Technology Risks
  - Multiple Pre-SDD Contracts w/Down-Select
- SDD Start FY08
  - Dependent Upon on 2-Year Pre-SDD Effort
  - Possible Phased SDD Based Upon PDR
- 7-Year SDD Program Leads to IOC ≈ 2016
- Production Sufficient to Outfit EA-18G Inventory
- Commonality at Sub-System/Component Levels with Future USAF & USMC AEA Capabilities
  - Joint-Service Application Permits Cost Sharing

Take-Away….

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- A Large ACAT I Program
  - Cost in Billions, not Millions
  - IOC At Least 13 Years Out
- Some Technology Advances Needed
- Navy Fiscal Realities Make 2006 Soonest Possible Start
- Life Cycle Costs Could be Dramatically Lowered if Air Force Partnering Possible
- ALQ-99 Sustaining Investments Still Needed
- Community-Wide Effort Needed to Define Program and Gain Support

Next Generation Jammer Will Transform Electronic Attack for the EA-18G and All Future AEA

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Questions?

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BACK UP

NextGen Jammer Technology

Transitioning to Active Electronically Scanned Arrays

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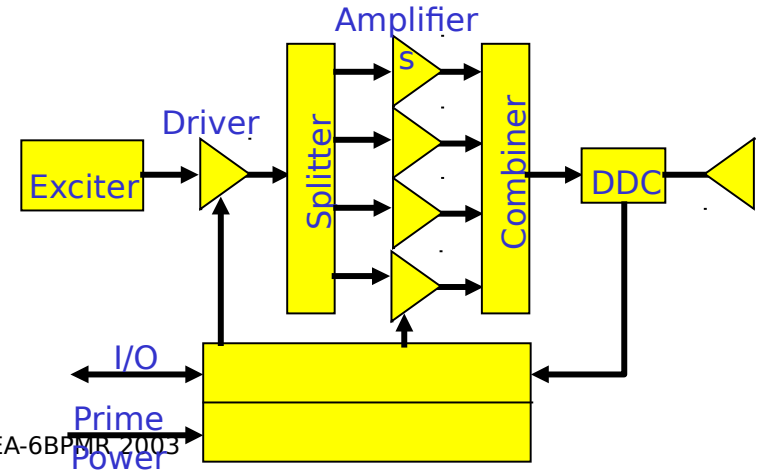
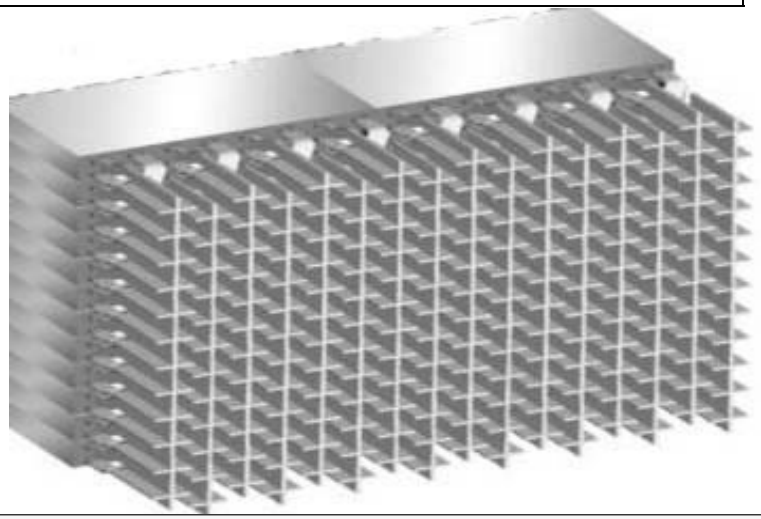
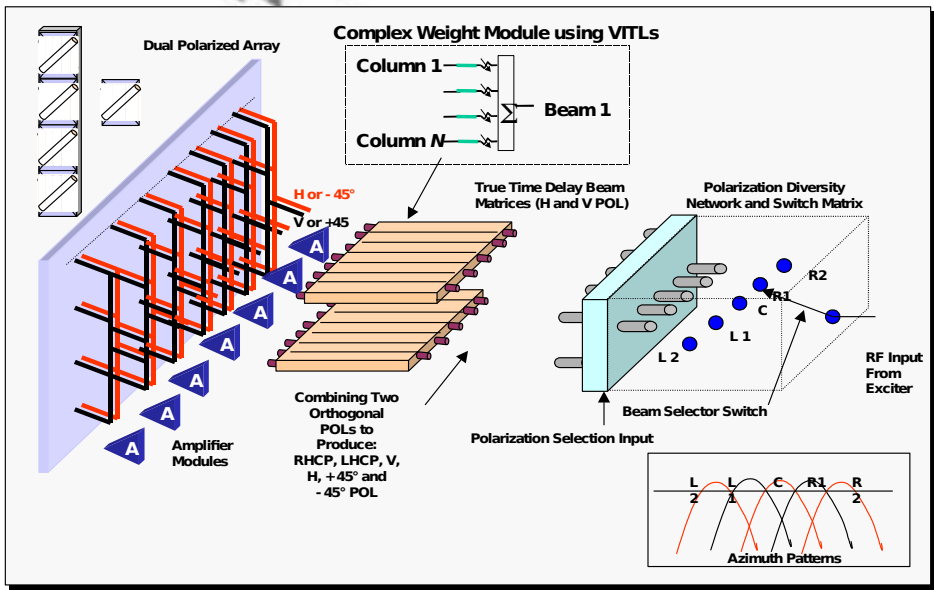
Today's ALQ-99 Jammer

Bands 7/8 & 9/10 (TWT)
LBT (Solid State)



Tomorrow's AESA Jammer





NextGen Pod Spiral Development

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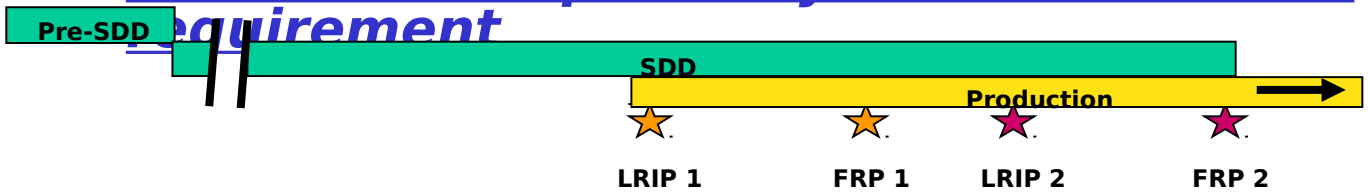
- First spiral must cover Bands 4 & 5/6 (at least)
- Must be part of comprehensive pod requirements
  - ERP, Polarization control, modulations, fratricide reduction, etc.
- Initial capability must be upgradeable or expandable to full NextGen pod capabilities
- New pod development
  - New form factor, transmitters, antennas, exciters, RAT, etc.
  - ***Backward compatibility with EA-6B not a requirement***



Spiral 1 – At Minimum, Bd 4/6 Capability

Contractor/ Integration Testing | DT/OA - I

Would include development of at least Bd 4/6 capability and pod structure, power source, cooling required to house both this initial capability and any expanded frequency capability developed and added in Spiral 2

OT - I

Spiral 2 – Full Capability

Contractor/ Integration Testing | DT/OA - II

Would include development of full frequency capability and any additional pod structure, power source & cooling that may be required for expansion to full capability.

OT - II